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Combining airborne remote sensing (lidar, spectrometer) of CH4 as well as in-situ data to determine CH4 emissions of a European CH4 emission hot spot area – initial results from the COMET campaign

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In order to improve our knowledge on emissions of the second most important anthropogenic greenhouse gas Methane (CH4), a coordinated measurement campaign in the Upper Silesian Coal Basin (USCB) in Poland, one of Europe's anthropogenic CH4 hot spots, was executed. The 4 weeks campaign in May/June 2018 was carried out by a team of scientists deploying in-situ and remote sensing instruments on aircraft as well as on ground. Two Cessna aircraft – one equipped with in-situ sensors for CH4 and related gases, another equipped with the CH4 remote sensing instrument MAMAP - concentrated on characterizing the CH4 distribution in the USCB with high horizontal and vertical detail. The German research aircraft HALO - equipped with the CH4 and CO_2 detecting lidar CHARM-F, as well as with in-situ sensors – provided the larger scale picture about atmospheric CH4 distributions. These aircraft based measurements were complemented by ground based observations: several ground-based FTIR instruments as well as wind lidars were deployed. In addition, in-situ measurements from mobile vans and small drones provide near-surface information of CH4. In order to assess regional and local scale fluxes using the data set collected, a hierarchy of modelling approaches (mass balance/Gaussian plume modelling, regional inverse modelling, chemistry-climate modelling with regional refinement) is planned to be used. The paper will present initial findings from the CoMet campaign with a focus on CH4 emissions from coal mine venting shafts as well as a first top-down estimate of total CH4 emissions of the Upper Silesian Coal Basin.